

## IN THE CLAIMS

Please cancel claims 1-4 and 14-31 without prejudice.

Please add the following new claims:

32. The method of claim 6 wherein a model image is generated from said canonical polynomial which is a best match canonical polynomial selected based on a difference between the original image and said model image.

33. The method of claim 7 wherein a model image is generated from said canonical polynomial which is a best match canonical polynomial selected based on a difference between the original still image and said model image.

34. The method of claim 10 further comprising the step of selecting said coefficients based upon a quality determination.

35. The method of claim 10 wherein a model image is generated from said canonical polynomial, which is a best match canonical polynomial selected based on a difference between the original image and said model image.

36. The method of claim 35 wherein said difference is calculated using the equation:

$$Q = \sqrt{\frac{1}{MN} \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} (i_o(x, y) - i_m(x, y))^2}$$

37. The method of claim 13 wherein said polynomial form comprises a canonical polynomial selected based on predetermined criteria indicative of image quality.

38. The method of claim 13 wherein said object boundaries comprise at least one isomorphic singularity.

39. The method of claim 38 wherein the polynomial form is selected from a table of canonical polynomials.

40. The method of claim 39 wherein said table of canonical polynomials comprises

Type	f(x,y)	Type	f(x,y)
1	x (without singularities)	8	$x^4 + x^2y + xy^2$
2	$x^2$ (fold)	9, 10	$x^5 \pm x^3y + xy$
3	$x^3 + xy$ (Whitney's tuck)	11,12	$x^3 \pm xy^4$
4, 5	$x^3 \pm xy^2$ (3/1 type curve)	13	$x^4 + x^2y + xy^3$
6	$x^3 + xy^3$ (9/2 type curve)	14	$x^5 + xy$
7	$x^4 + xy$ (4/3 type curve)		

41. The method of claim 40 wherein a transformation is applied to said selected canonical polynomial to obtain a function describing a model surface.

42. The method of claim 41 wherein said transformation is a non-homogeneous linear transformation.

43. The method of claim 42 wherein said non-homogeneous linear transformation takes the form:

$$f_{\text{canonical}} = x_1^3 + x_1 x_2$$

44. The method of claim 43 wherein a model surface is obtained from said non-homogeneous linear transformation as follows:

$$x_1 = (y_1 + a_1 y_1^2 + \dots a_n y_n^2); x_2 = (y_2 + b_1 y_2^2 + \dots b_n y_n^2).$$

45. The method of claim 44 wherein a quality determination is calculated by determining the difference between the original and model segments on a pixel-by-pixel basis using the equation:

$$Q = \sqrt{\frac{1}{MN} \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} (i_o(x, y) - i_m(x, y))^2}$$

46. A method of imaging compression comprising the step of characterizing aspects of an image to be compressed with singular manifold representations.

47. The method of claim 46 wherein said aspects are surfaces of objects.

48. The method of claim 46 wherein said singular manifold representations are represented by canonical polynomials.

49. The method of claim 48 further comprising the step of reducing said polynomials to compact tabulated normal form polynomials which comprise simple numbers.

50. A method of still image encoding comprising the following steps:

- (a) capturing a frame;
- (b) dividing said frame into segments of pixels;

(c) determining the dynamic range of a segment by subtracting the intensity of the pixel having maximum intensity from the intensity of the pixel having minimum intensity in said segment;

(d) comparing said dynamic range to a threshold below which said segment is likely to represent background;

(e) selecting a canonical polynomial from a table if said threshold in (d) above is exceeded;

(f) compressing said segment using standard texture compression techniques and storing the result if the threshold of step (d) is not exceeded;

(g) performing a transformation on said canonical polynomial to obtain an equation representing a modeled surface;

(h) substituting the coordinates of each pixel from said segment into said equation representing said modeled surface to obtain a matrix of modeled surface elements of said segment;

(i) calculating the overall quality of the modeled surface of said segment compared with said original segment by (1) subtracting the difference between the pixels of said original segment and corresponding pixels of said modeled surface (2) squaring said differences (3) summing up all of said squares and (4) taking the square root of said sum to arrive at a quality determination for said modelled surface;

(j) comparing said quality determination of step (i) to a predetermined threshold;

(k) selecting new coefficients for said canonical polynomial if said quality determination is greater than said predetermined threshold of step (j) and repeating steps (i) and (j) until a best quality determination, less than said predetermined threshold of step (i) is achieved;

(l) storing said best quality determination for said canonical polynomial and said coefficients that produced said best quality determination;

(m) repeating steps (f-l) for polynomials not yet tested until all canonical polynomials from said table have been tested for said segment;

(n) determining the polynomial having the overall best quality determination of the polynomials tested for said segment to arrive at a selected polynomial for said segment;

(o) storing the coefficients for said selected polynomial representing a model surface for said segment;

(p) selecting a next segment of said frame and performing steps (c) through (o) on all such next segments until all segments of the frame have been selected;

(q) calculating the average distance between said model surface of said segment and each adjacent segment of said frame to determine if connections to neighboring segments can be made;

(r) comparing the average distances determined in the preceding step to a threshold average distance;

(s) extending said model surface to adjacent segments if the average distance between such segments is less than said threshold average distance;

(t) calculating a spline to approximate the surface of adjacent segments if the average distance for any such segment exceeds said threshold average distance to form a graph;

(u) constructing a model image of the entire frame by creating a table of all of the data representing the modelled segments to obtain a matrix describing the entire modeled frame surface;

(v) calculating the peak signal to noise ratio over the entire frame;

(w) comparing the peak signal to noise ratio of the entire frame to a signal to noise threshold;

(x) calculating a difference frame by subtracting the value of each pixel of the model image from each pixel of the original captured frame if the peak signal to noise ratio exceeds said signal to noise threshold;



(c) creating a model image  $I_m$  comprised of said canonical images and by finding connections between neighboring blocks of pixels thereby smoothing out intensity physical structure of said modelled image;

(d) recapturing lost high frequency content of said image, if any, by subtracting said model Image  $I_m$  from said original image  $I_o$ .

57. A method of automatic target recognition comprising using datery obtained from an isomorphic singular manifold projection.

58. A method of object target detection comprising using datery obtained from an isomorphic singular manifold projection.

59. A method of tracking a target comprising using datery obtained from an isomorphic singular manifold projection.

60. A method of zooming comprising using datery obtained from an isomorphic singular manifold projection.

61. A method of image enhancement comprising using datery obtained from an isomorphic singular manifold projection method.

62. A method of automatic target recognition utilizing isomorphic singular manifold projection whereby critical soft edge information may be extracted and transmitted over a smart local area network between adjacent camera platforms to provide cooperative scene information for an observer.

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